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5 December 1991

Dear Consultee

THE BUILDING REGULATIONS 1991
APPROVED DOCUMENT PREPARED BY TRADA
TIMBER INTERMEDIATE FLOORS

You are invited to comment on the enclosed proposed draft Approved Document prepared by the Timber Research and Development Association (TRADA). The document contains guidance on the design and construction of timber intermediate floors in dwellings to comply with the relevant requirements of the Building Regulations 1991.

The TRADA Approved Document is the first non-departmental guidance document to be prepared under the provisions of Section 6(1)(b) of the Building Act 1984, which empower the Secretary of State to approve any document issued or proposed to be issued otherwise than by him for the purpose of providing practical guidance with respect to the requirements of the Building Regulations. The Department's Approved Documents provide a basic level of guidance on each Part of the Regulations, whereas this "private sector" Approved Document covers all the regulatory requirements relating to a particular form of construction (timber intermediate floors in dwellings). We believe that the TRADA Approved Document will provide an interesting and helpful alternative to our approach based on individual parts of the Regulations.

In addition to any comments you may have on the technical guidance provided, your views are particularly sought on the style in which the material is presented. For instance, do you welcome the inclusion of additional advice based on "good practice" and the manner in which this has been identified, or do you consider that the guidance in the document should be strictly limited to that necessary to comply with the relevant requirements of the Regulations.

Your views on the design of the front cover are also requested. In particular, would you prefer the cover of non-departmental Approved Documents to reflect the "house style" of the organisation concerned, or should the established design be maintained, perhaps using a different colour and with the logo of the responsible organisation replacing the crest of the Secretary of State.

A list of those to whom this consultation letter has been sent is enclosed and it would be helpful for me to know, as soon as possible, of any other organisation you consider should have received a copy.

When commenting you are asked to indicate:

1. whether you propose to publish your response or to make it available to the media; and

2. whether you agree to the Department making your response available to Parliament and to the public by placing copies in the libraries of both Houses of Parliament and in the Department's own library. If you do agree, would you please send four copies. If not, your response will be treated as 'in confidence' to the Government, although it may be included in a numerical survey of views carried out without identifying individual respondents.

Comments should be addressed to:

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Your comments should be sent as soon as possible and, in any event, not later than *28 February 1992*.

Yours faithfully

Paul F Everall

P F Everall
Building Regulations Division

The TRADA Approved Document has been distributed to the following

Architects and Surveyors Institute
Assoc of Structural Fire Protection Contractors and Manufacturers
Association for the Conservation of Energy
Association of British Chambers of Commerce
Association of British Insurers
Association of Builders Hardware Manufacturers
Association of Building Component Manufacturers
Association of Consultant Architects
Association of Consulting Engineers
Association of County Councils
Association of District Councils
Association of London Authorities
Association of Metropolitan Authorities
Association of Municipal Engineers
Brick Development Association
British Automatic Sprinkler Association
British Board of Agrement
British Cement Association
British Institute of Architectural Technicians
British Masonary Society
British Property Federation
British Standards Institution
British Wood Preserving Association
Builders Merchants Federation
Building Design Partnership
Building Employers Confederation
Building Energy Efficiency Confederation
Building Societies Association
Chartered Institute of Building
Chartered Institution of Building Services Engineers
Chief and Assistant Chief Fire Officers Association
CLASP Development Group
Confederation of British Industry - Building Regulations Working Group
Confederation of Construction Specialists
Consortium FW Method Building (MACE)
District Planning Officers Society
District Surveyors Association
Eurisol UK
Federation of Civil Engineering Contractors
Fibre Building Board Development Organisation
The Fire Brigades Union
Fire Officers Committee
Fire Protection Association
Fire Service Technical College
Gypsum Products Development Association
House Builders Federation

Housing Corporation
Incorporated Association of Architects and Surveyors
Institute of Building Control
Institute of Housing
Institution of Civil Engineers
Institution of Fire Engineers
Institution Structural Engineers
Instumescent Fire Seals Association
Loft Conversion Specialists Association
London Boroughs Association
Thermal Insulation Manufacturers and Suppliers Association
Municipal Mutual Insurance Limited
National Association of Fire Officers
National Association of Loft Insulation Contractors
National Cavity Insulation Association
National Consumer Council
National Council of Building Material Producers
National Federation of Housing Associations
National Federation of Self-Employed and Small Businesses Limited
National House Building Council
Neighbourhood Energy Action
Prefabricated Building Manufacturers of GB Ltd
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Society of Chief Architects of Local Authorities
Steel Construction Institute
Structural Insulation Association
Suspended Ceilings Association
Swedish Finnish Timber Council
Timber Trade Federation of the UK
Trades Union Congress - Construction Industry Committee
UK and Ireland Particleboard Association
Warrington Research Centre

The Building Regulations 1991

APPROVED DOCUMENT

TIMBER INTERMEDIATE FLOORS

(requiring 30 minutes or 60 minutes fire resistance, excluding compartment floors)

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APPROVED DOCUMENTS

This document has been prepared by the Timber Research and Development Association (TRADA). It has been approved by the Secretary of State under Section 6 of the Building Act 1984 as practical guidance to meeting the requirements of paragraphs A1, B2, B3, J3 and L1 in Schedule 1 to the Building Regulations 1991 as they apply to timber joist floors requiring 30 minutes or 60 minutes fire resistance for dwellings (excluding compartment floors).

In its specific application this TRADA document supplements the basic level of guidance provided by the Secretary of State on each part of the Regulations. Like all Approved Documents, however, it places no obligation on the user to adopt any particular solution if the requirements of the Building Regulations can be met in some other way.

However, should a contravention of a requirement be alleged then, if you have followed the guidance in this document or any other relevant AD, that will be evidence tending to show that you have complied with the Regulations. If you have not followed the guidance then that will be evidence tending to show that you have not complied. It will then be up to you to demonstrate by other means that you have satisfied the requirement.

OTHER REQUIREMENTS

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which that document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs of Schedule 1 to the Regulations. There are Approved Documents which give guidance on the requirements in Schedule 1 and on regulation 7.

LIMITATION ON REQUIREMENTS

In accordance with regulation 8, the requirements in Parts A to K and N of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing the reasonable health and safety of persons in or about the building.

MATERIALS AND WORKMANSHIP

Any building work which is subject to requirements imposed by Schedule 1 of the Building Regulations should, in accordance with regulation 7, be carried out with proper materials and in a workmanlike manner.

You may show that you have complied with Regulation 7 in a number of ways, for example, by the appropriate use of a product bearing an EC mark in accordance with the Construction Products Directive (89/106/EEC), or by following an appropriate technical specification (as defined in that Directive), a British Standard, a British Board of Agrèment Certificate, or an alternative national technical specification of any member state of the European Community which, in use, ~~provides an equivalent level of protection and performance with respect to the relevant requirements of Schedule 1~~ IS EQUIVALENT. You will find further guidance in the Approved Document supporting regulation 7 on materials and workmanship.

Technical specifications

Building Regulations are made for specific purposes; health and safety, energy conservation and the welfare and convenience of disabled people. Standards and technical approvals are relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance such as serviceability or aspects which, although they relate to health and safety, are not covered by the Regulations.

The Secretary of State has agreed with the British Board of Agrèment on the aspects of performance which it needs to assess in preparing its Certificates in order that the Board may demonstrate the compliance of a product or system, which has an Agrèment Certificate, with the requirements of the Regulations. An Agrèment Certificate issued by the Board under these arrangements will give assurance that the product or system to which the Certificate relates, if properly used in accordance with the terms of the Certificate, will meet the relevant requirements.

Similarly, the appropriate use of a product which complies with a European Technical Approval as defined in the Construction Products Directive will also meet the relevant requirements.

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TIMBER JOIST FLOORS REQUIRING 30 MINUTES OR 60 MINUTES FIRE RESISTANCE FOR DWELLINGS (excluding Compartment Floors)

1.0 INTRODUCTION

1.1 This document provides design guidance for timber joist floors which are loadbearing elements of structure carrying a domestic imposed load of 1.5 kN/m^2, which are contained within buildings up to three storeys in height above ground level, used as single occupancy dwellings, and which require either 30 minutes or 60 minutes fire resistance. Figure 1 illustrates the floors which are covered by the document.

The guidance also applies to floors in blocks of flats of not more than three storeys having no more than four self-contained dwelling units per floor accessible from one staircase.

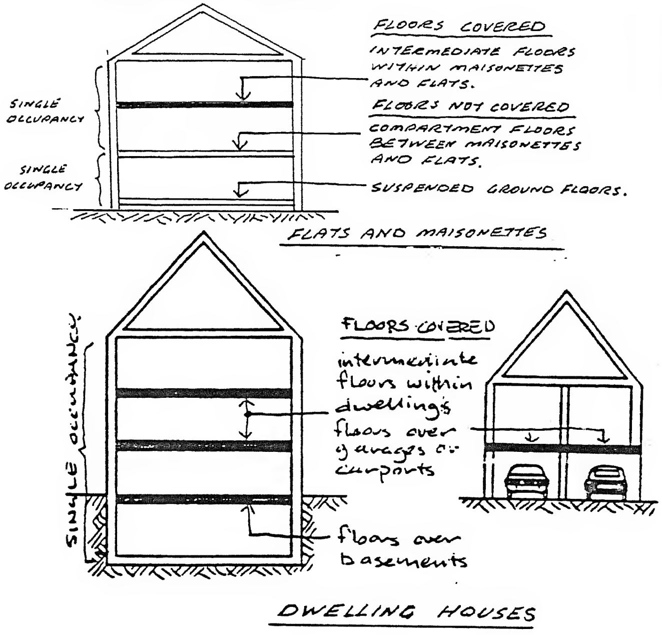


Figure 1 - Definition of floors covered

1.2 This is an 'element design document' which describes one means of designing and constructing floors to meet all relevant performance requirements of the Building Regulations. The document also covers other additional requirements of good practice recommended by TRADA. Where appropriate, the two are distinguished in the right-hand column. The document deals with the following Requirements from Schedule 1 to the Building Regulations 1991 and takes effect on 1 June 1992.

Requirement
to which the
Guidance
relates

PART A STRUCTURE

Requirement	Limits on application
Loading A1. - (1) The building shall be constructed so that the combined dead, imposed and wind loads are sustained and transmitted by it to the ground - (a) safely, and (b) without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building. (2) In assessing whether a building complies with sub-paragraph (1) regard shall be had to the imposed and wind loads to which it is likely to be subjected in the ordinary course of its use for the purpose for which it is intended.	

PART B FIRE SAFETY

Requirement	Limits on application
Internal fire spread (linings) **B2.—(1) To inhibit the spread of fire within the building the internal linings shall–** **(a) resist the spread of flame over their surfaces; and** **(b) have, if ignited, a rate of heat release which is reasonable in the circumstances.** **(2) In this paragraph "internal linings" mean the materials lining any partition, wall, ceiling or other internal structure.**	
Internal fire spread (structure) **B3.—(1) The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.** **(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.**	

PART J HEAT PRODUCING APPLIANCES

Requirement	Limits on application
Protection of building J3. Heat producing appliances and flue-pipes shall be so installed, and fire-places and chimneys shall be so constructed, as to reduce to a reasonable level the risk of the building catching fire in consequence of their use.	The requirements in this Part apply only to fixed heat producing appliances which – (a) are designed to burn solid fuel, oil or gas; or (b) are incinerators.

PART L CONSERVATION OF FUEL AND POWER

Requirement	Limits on application
L1. Reasonable provision shall be made for the conservation of fuel and power in buildings.	**This requirement applies only to–** **(a) dwellings; and** **(b) other buildings whose floor area exceeds 30m^2.**

Requirement
to which the
Guidance
relates

2.0 STRUCTURE

2.1 Floor joists

2.1.1 For this document the structural design of timber floor joists has been carried out in accordance with BS 5268: Part 2: 1988 "Code of practice for permissible stress design, materials and workmanship". The design takes account of loadings specified in BS 6399: Part 1: 1984 "Code of practice for dead and imposed loads". A1

2.1.2 In dwellings the imposed (live) load for floors is 1.5 kN/m^2. Table 1 shows timber joist sizes which satisfy the requirements of BS 5268: Part 2 for domestic loadings and the deflection criterion of 0.003 times span or 14 mm, whichever is the greater. Table 1 also provides guidance for dealing with the loads imposed by non-loadbearing partitions. A1 (WITH REGARD TO IMPOSED LOADING.)

2.1.3 Table 1 relates to strength classes which are included in BS 5268: Part 2. These strength classes are based primarily on bending strength which means that any one species may occur in more than one strength class, depending upon the stress grade. The softwoods generally used for domestic timber joists are incorporated in strength classes SC3 and SC4. Table 2 relates the commonly used softwoods to these strength classes. A1

A1

Table 1

SPAN TABLES FOR FLOOR JOISTS

Table 1 lists the maximum permissible clear spans of floor joists. All joist sizes are based on a domestic imposed floor loading of 1.5 kN/m^2.

The tables make no allowance for the self-weight of non-loadbearing partitions, but the following rules of thumb may be used as a guide and refined by calculation where necessary:

- partitions which weigh less than 0.8kN per m run (81.5kg/m run) parallel with joists - supported by an extra joist (see Figure 13)
- partitions at right angles to joists - reduce the maximum span in the table by 10% provided partitions weigh less than 0.8 kN per m run (81.5 kg/m run).

Table 1 SPAN TABLES FOR FLOOR JOISTS: SC 3 AND SC 4 TIMBER

Finished size of joist mm		Dead load (kN/m^2) supported by joist, excluding self weight of joist					
		not more than 0.25 (25.5 kg/m^2)			more than 0.25 but not more than 0.50 (51kg/m^2)		
		Spacing of joist centres mm					
		400	450	600	400	450	600
		Maximum clear span of joist m					
Regularized*	SC 3						
38 x 147		2.98	2.87	2.51	2.85	2.71	2.33
170		3.44	3.31	2.87	3.28	3.10	2.69
195		3.94	3.75	3.26	3.72	3.52	3.06
220		4.43	4.19	3.65	4.16	3.93	3.42
47 x 147		3.20	3.08	2.79	3.06	2.95	2.61
170		3.69	3.55	3.19	3.53	3.40	2.99
195		4.22	4.06	3.62	4.04	3.89	3.39
220		4.72	4.57	4.04	4.55	4.35	3.79
63 x 147		3.52	3.39	3.08	3.37	3.24	2.95
170		4.06	3.91	3.56	3.89	3.74	3.40
195		4.63	4.47	4.07	4.44	4.28	3.90
220		5.06	4.92	4.58	4.91	4.77	4.37
75 x 195		4.83	4.70	4.31	4.68	4.52	4.13
220		5.27	5.13	4.79	5.11	4.97	4.64
Surfaced four sides							
38 x 140		2.84	2.73	2.40	2.72	2.59	2.17
184		3.72	3.56	3.09	3.53	3.33	2.90
235		4.71	4.46	3.89	4.43	4.18	3.64
Regularized*	SC 4						
38 x 147		3.10	2.98	2.71	2.97	2.85	2.59
170		3.58	3.44	3.13	3.43	3.29	2.99
195		4.10	3.94	3.58	3.92	3.77	3.42
220		4.61	4.44	4.03	4.41	4.25	3.86
47 x 147		3.33	3.20	2.91	3.19	3.06	2.78
170		3.84	3.69	3.36	3.67	3.54	3.21
195		4.39	4.22	3.85	4.20	4.05	3.68
220		4.86	4.73	4.33	4.71	4.55	4.14
63 x 147		3.67	3.52	3.21	3.50	3.37	3.07
170		4.21	4.06	3.70	4.04	3.89	3.54
195		4.77	4.64	4.23	4.61	4.45	4.05
220		5.20	5.06	4.73	5.05	4.91	4.56
75 x 195		4.97	4.83	4.47	4.82	4.69	4.29
220		5.42	5.27	4.93	5.25	5.11	4.78
Surfaced four sides							
38 x 140		2.96	2.84	2.58	2.83	2.72	2.47
184		3.87	3.72	3.38	3.70	3.56	3.23
235		4.85	4.71	4.31	4.70	4.54	4.12

* Regularized - surfaced top and bottom

Requirement
to which the
Guidance
relates

A1

Table 2 SPECIES AND GRADE COMBINATIONS WHICH SATISFY STRENGTH CLASSES SC 3 AND SC 4

Species	Origin	Grading rules	Grades to satisfy Strength Class	
			SC 3	SC 4
Redwood	European	BS 4978	GS, M50	SS, M75 +
Whitewood	European	BS 4978	GS, M50	SS, M75 +
Douglas fir	UK	BS 4978	M50, SS	M75 *
Scots pine	UK	BS 4978	GS, M50	SS, M75 *
European spruce	UK	BS 4978	Available machine graded to strength class	
Sitka spruce	UK	BS 4978	Available machine graded to strength class	
Larch	UK	BS 4978	GS	SS
Sitka spruce	Canada, USA	BS 4978	SS	
		NLGA & NGRDL:		
		- Joist & Plank	Select	
		- Structural light framing	Select	
Douglas fir-larch	Canada, USA	BS 4978	GS	SS
		NLGA & NGRDL:		
		- Joist & Plank	No 1, No 2	Select
		- Structural light framing	No 1, No 2, Select *	Select *
		North American MACHINE	1450f-1.3E	1650f-1.5E
Hem-fir	Canada, USA	BS4978	GS, M50	SS, M75
		NLGA & NGRDL:		
		- Joist & Plank	No 1, No 2	Select
		- Structural light framing	No 1, No 2, Select *	Select *
		North American MACHINE	1450f-1.3E	1650f-1.5E
Spruce-pine-fir	Canada, USA	BS 4978	GS, M50	SS M75 +
		NLGA & NGRDL:		
		- Joist & Plank	No 1, No 2	Select
		- Structural light framing	No 1, No 2, Select *	Select *
		North American MACHINE	1450f-1.3E	1650f-1.5E
Western whitewoods	USA	BS 4978	SS	
		NLGA & NGRDL:		
		- Joist & Plank	Select	
		- Structural light framing	Select	
Southern pine	USA	BS 4978	GS	SS
		NLGA & NGRDL:		
		- Joist & PLank	No 1, No 2, No 3	Select
		- Structural light framing	No 1, No 2, No 3, Construction *	Select *
		- Stud	Stud *	
		North American MACHINE	1450f-1.3E	1650f-1.5E

Notes to Table 2:
GS and SS grades to BS 4978:1988 'Specification for timber grades for structural use'.
*Suitability of grade depends on section size.
+ These grades are SC5 - they are included here so they can be used with these tables
NLGA is the National Lumber Grading Association (Canada)
NGRDL is the National Grading Rules for Dimension Lumber (USA)

2.1.4 The moisture content of timber joists should not be greater than 19% at the time of installation. BS 5268 Part 2

2.2 **Support~~ing~~ of timber joists**

2.2.1 Timber joist floors are designed to span between structural walls, usually masonry or timber frame. There are three principal methods of joist support at these walls: built into masonry cavity walls, shown in Figure 2; on joist hangers in masonry cavity or masonry solid walls, shown in Figure 3 or as a platform floor in timber frame walls, shown in Figure 4 A1

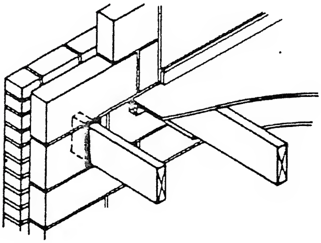


Figure 2 - Joists built in

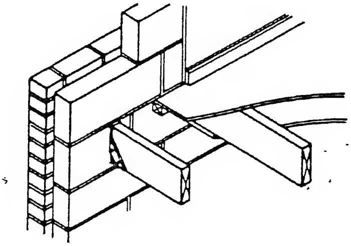


Figure 3 - On joist hangers

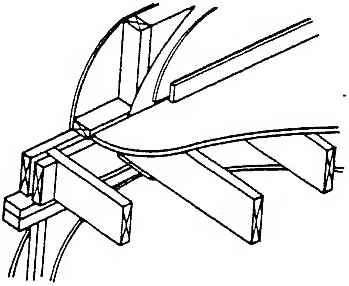
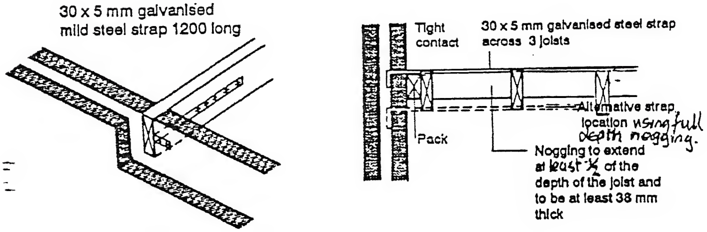


Figure 4 - Platform floors

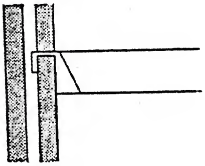
		Requirement to which the Guidance relates
2.2.2	Joists should not be built into masonry separating walls as there is a risk that the sound insulation could be impaired.	Good practice
2.2.3	The ends of joists built into masonry cavity walls should be protected against moisture (eg by end sealing with a bitumen-type paint) or be preservatively pre-treated.	Good practice
2.2.4	Joists should not be built into single leaf external masonry walls with no air gap, eg fair-faced or rendered, but may be incorporated into single leaf masonry walls clad with tiles or boards on battens.	Good practice
2.2.5	Joists should have a minimum end bearing of 50 mm x width of joist.	A1
2.2.6	Joints in joists should only occur over load-bearing walls.	A1
2.2.7	In order to restrict movement at right angles to their plane, certain walls require horizontal lateral support from floors above ground level. These walls are masonry external or separating walls greater than 3 metres in length and any internal masonry loadbearing wall. The methods of providing lateral support are shown in Figure 5.	A1


30 x 5 mm galvanised mild steel strap 1200 long
Tight contact
30 x 5 mm galvanised steel strap across 3 joists
Alternative strap location using full depth nogging.
Pack
Nogging to extend at least ½ of the depth of the joist and to be at least 38 mm thick

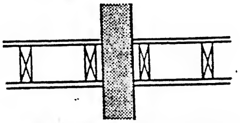
A. Longitudinal strap B. Right angle strap
Straps must be at not greater than 2m intervals
Manufacturers' test data may provide alternative solutions

Figure 5 - Lateral support by floors

The longitudinal straps are not required in dwellings up to two storeys where the joists have at least a 90 mm bearing on the supported wall or a 75 mm bearing on a timber wall plate at each end or, where the joists are carried on a restraint-type joist hanger (see Figure 6). Longitudinal straps are also not required at internal loadbearing walls when the conditions shown in Figure 7 are met.



where contact between floors and walls on both sides of the wall is at intervals no greater than 2m.



floors should be at or about the same level on each side of the wall. Where lateral support is intermittent, the point of contact should be in line or nearly in line.

Figure 6 - Restraint type joist hanger - as described in BS 5628:Part 1

Figure 7 - Restraint at internal walls

Timber frame walls with a platform type floor do not require additional lateral restraint in the form of steel straps.

2.2.8 Joist hangers should be specified and installed in accordance with the requirements of BS 6178: Part 1: 1982 "Specification for joist hangers for building into masonry walls of domestic dwellings". **A1**

2.3 Allowance for differential movement

2.3.1 Where timber joists bear on a beam of a different material, allowance for a minimum of 10 mm differential movement should be made. This is to prevent future distortion of floor decking materials. An example is shown in Figure 8. Good practice

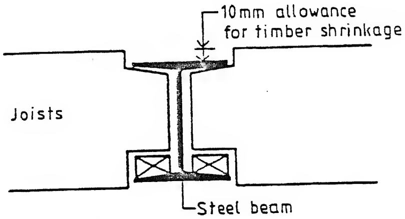


Figure 8 - Allowance for joist movement

2.4 Notching and drilling

2.4.1 Notching and drilling of joists should not exceed the limits set out in Figure 9, except where the notches and/or drillings are calculated by a competent person. BS 5268 Part 2

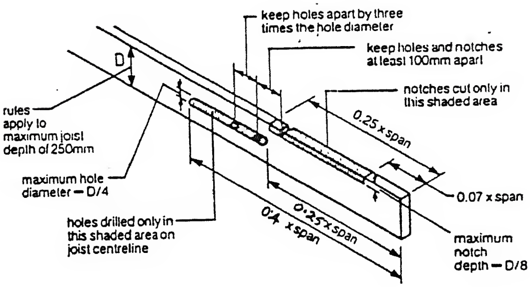
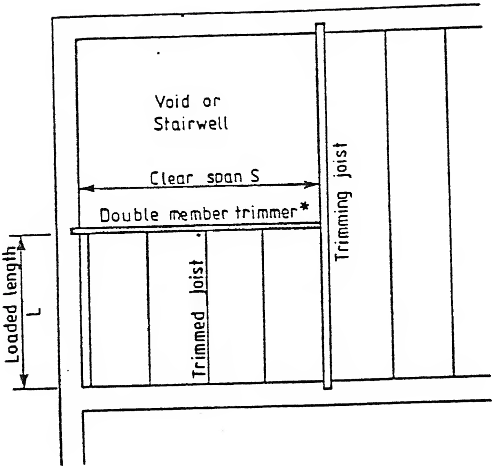

keep holes apart by three times the hole diameter
keep holes and notches at least 100mm apart
notches cut only in this shaded area
D
rules apply to maximum joist depth of 250mm
maximum hole diameter — D/4
holes drilled only in this shaded area on joist centreline
0.25 x span
0.07 x span
0·25 x span
0·4 x span
maximum notch depth — D/8

Figure 9 - Notching and drilling

2.5 Trimmers and trimming joists

2.5.1 Table 3 gives spans for trimmers while Tables 4 and 5 give spans for trimming joists. The tables make allowance for supporting non-loadbearing internal partitions and are therefore conservative for situations where no partitions occur. The span tables are designed to take account of all common opening sizes in domestic floors. Where openings fall outside the range of Tables 3-5, trimmers and trimming joists should be calculated in accordance with BS 5268: Part 2: 1988. **A1**



*Double member trimmer to be securely bolted together along its length. As given in note 3.

Figure 10 - PLAN A
Plan on double member trimmer supporting trimmed joists

A1

Notes to Table 3

NOTE 1 The sizes of the double beams or trimmers shown on Plan A in Figure 10 will support loads from the following:

- the trimmed floor joists;
- lightweight non-loadbearing partitions weighing not more than 0.8 kN/m run supported off the trimmer or trimmed joists;

and

- an imposed load not exceeding 1.5 kN/m^2.

Note: the dead load of the floor construction should not exceed 0.5 kN/m^2 excluding joist self-weight.

NOTE 2 The section sizes given in Table 3 are in accordance with the requirements and tolerances of BS 4471: 1987 "Specification for sizes of sawn and processed softwood".

NOTE 3 The use of multiple joists to make up members of equivalent total thickness to those given in Table 3 is permitted provided that these multiple members are securely bolted together using a staggered row of M10 bolts spaced at 600 mm centres to ensure composite action.

NOTE 4 No notching or drilling of a beam or trimmer should be carried out unless checked by a competent person.

NOTE 5 The design has been based on BS 5268: Part 7: Section 7.1: 1989 "Recommendations for the calculation basis for span tables: Domestic floor joists".

Requirement
to which the
Guidance
relates

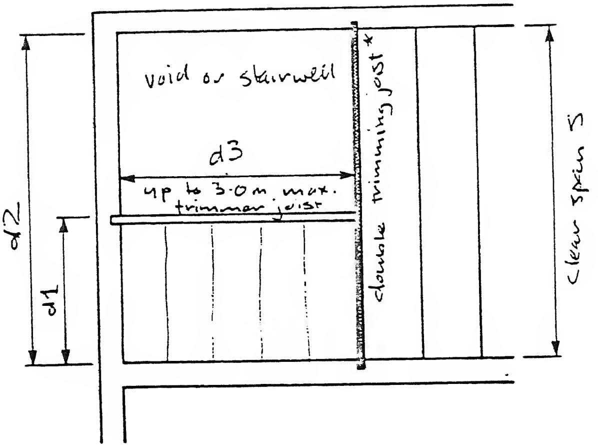
A1

Table 3

PERMISSIBLE CLEAR SPANS OF TRIMMERS WHICH SUPPORT TRIMMED JOISTS AND NON LOADBEARING LIGHTWEIGHT PARTITIONS

Size of beam or trimmer (mm)		Loaded length (m) l on Plan A (Figure 10)					
		1.0	2.0	3.0	4.0	5.0	6.0
		Clear spans (m) S on Plan A					
Regularized*		SC3					
2 x 38 x	147	2.37	1.91	1.58	1.36	1.16	0.87
	170	2.75	2.23	1.85	1.60	1.42	1.11
	195	3.17	2.57	2.14	1.86	1.65	1.38
	220	3.58	2.90	2.43	2.11	1.88	1.64
2 x 47 x	147	2.56	2.15	1.79	1.55	1.37	1.23
	170	2.97	2.50	2.09	1.81	1.61	1.46
	195	3.41	2.88	2.41	2.10	1.87	1.70
	220	3.86	3.25	2.73	2.39	2.13	1.93
2 x 63 x	147	2.83	2.39	2.12	1.84	1.64	1.48
	170	3.28	2.78	2.46	2.15	1.92	1.74
	195	3.77	3.21	2.84	2.48	2.22	2.02
	220	4.25	3.63	3.21	2.81	2.52	2.30
2 x 75 x	147	3.00	2.55	2.27	2.03	1.81	1.64
	170	3.48	2.96	2.64	2.37	2.12	1.93
	195	3.99	3.41	3.05	2.73	2.45	2.23
	220	4.50	3.86	3.45	3.09	2.78	2.53
Surfaced four sides							
2 x 38 x	140	2.25	1.82	1.50	1.29	1.07	0.80
	184	2.99	2.42	2.01	1.74	1.55	1.26
	235	3.83	3.10	2.60	2.27	2.02	1.80
2 x 63 x	140	2.69	2.27	2.01	1.74	1.55	1.40
	184	3.56	3.02	2.67	2.33	2.09	1.90
	235	4.54	3.89	3.43	3.01	2.70	2.46
Regularized*		SC4					
2 x 38 x	147	2.48	2.08	1.84	1.67	1.27	0.97
	170	2.88	2.43	2.15	1.95	1.57	1.22
	195	3.32	2.80	2.48	2.26	1.90	1.50
	220	3.75	3.18	2.82	2.57	2.23	1.78
2 x 47 x	147	2.68	2.25	2.00	1.81	1.68	1.36
	170	3.10	2.63	2.33	2.12	1.96	1.68
	195	3.57	3.03	2.69	2.46	2.28	2.03
	220	4.03	3.43	3.06	2.79	2.59	2.36
2 x 63 x	147	2.96	2.51	2.23	2.03	1.88	1.76
	170	3.43	2.92	2.60	2.37	2.20	2.07
	195	3.94	3.36	3.00	2.74	2.55	2.39
	220	4.44	3.80	3.40	3.11	2.90	2.72
2 x 75 x	147	3.14	2.67	2.38	2.17	2.02	1.89
	170	3.64	3.10	2.77	2.53	2.36	2.21
	195	4.17	3.57	3.19	2.93	2.72	2.56
	220	4.70	4.04	3.62	3.32	3.09	2.91
Surfaced four sides							
2 x 38 x	140	2.36	1.98	1.74	1.58	1.18	0.89
	184	3.13	2.64	2.34	2.12	1.76	1.38
	235	4.01	3.40	3.02	2.75	2.42	1.95
2 x 63 x	140	2.82	2.38	2.12	1.93	1.79	1.67
	184	3.72	3.17	2.82	2.58	2.40	2.25
	235	4.75	4.07	3.64	3.34	3.10	2.92

* Surfaced top and bottom



*Double member trimming joist to be securely bolted together along the length. As given in note 3.

Figure 11 - PLAN B
Plan on double member trimming joist supporting trimmer

A1

Notes to Tables 4 and 5

NOTE 1 The sizes of the double trimming joists shown on Plan B in Figure 11 will support loads from the following:

- the trimmer;
- lightweight non-loadbearing partitions weighing not more than 0.8 kN/m run supported off the trimming joist, trimmer or trimmed joists; and
- an imposed load not exceeding 1.5 kN/m^2.

Note: the dead load of the floor construction should not exceed 0.5 kN/m^2, excluding joist self-weight

NOTE 2 The section sizes given in Tables 4 & 5 are in accordance with the requirements and tolerances of BS 4471: 1987 "Specification for sizes of sawn and processed softwood".

NOTE 3 The use of multiple joists to make up members of equivalent total thickness to those given in tables 4 & 5 is permitted provided that these multiple members are securely bolted together using a staggered row of M10 bolts at 600 mm centres to ensure composite action.

NOTE 4 No notching or drilling of a trimming joist should be carried out unless checked by a competent person.

NOTE 5 The design has been based on BS 5268: Part 7: Section 7.1: 1989 "Recommendations for the calculation basis for span tables: Domestic floor joists".

A1

Table 4 PERMISSIBLE CLEAR SPANS (m) OF SC3 TRIMMING JOISTS WHICH SUPPORT A TRIMMER AND NON LOADBEARING LIGHTWEIGHT PARTITIONS. (Figure 11)

Size of trimming joist (mm)		See Plan B for positions of d1, d2, d3 and S								
		For ratios of d_1/d_2 up to 0.2			For ratios of d_1/d_2 greater than 0.25 but less than 0.5			For ratios of d_1/d_2 greater than 0.5 but less than 0.75		
		Dimension d_3 (m)			Dimension d_3			Dimension d_3		
		1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0
		Clear spans (m) S on Plan B								
Regularized*										
2 x 38 x	147	3.03	2.77	2.57	2.56	2.19	1.87	2.45	2.11	1.83
	170	3.51	3.23	3.01	2.98	2.56	2.20	2.84	2.45	2.14
	195	4.04	3.73	3.49	3.43	2.95	2.55	3.27	2.81	2.47
	220	4.56	4.23	3.97	3.87	3.34	2.90	3.69	3.17	2.79
2 x 47 x	147	3.25	2.99	2.78	2.76	2.45	2.12	2.64	2.37	2.07
	170	3.77	3.48	3.25	3.20	2.86	2.48	3.06	2.74	2.41
	195	4.33	4.02	3.76	3.68	3.30	2.88	3.52	3.15	2.77
	220	4.88	4.55	4.27	4.16	3.74	3.27	3.97	3.55	3.13
2 x 63 x	147	3.58	3.31	3.09	3.05	2.72	2.49	2.92	2.66	2.43
	170	4.14	3.85	3.61	3.54	3.17	2.91	3.38	3.09	2.82
	195	4.75	4.43	4.17	4.06	3.66	3.37	3.88	3.56	3.24
	220	5.34	5.00	4.72	4.59	4.15	3.82	4.37	4.02	3.66
2 x 75 x	147	3.78	3.51	3.28	3.24	2.90	2.65	3.09	2.83	2.63
	170	4.37	4.07	3.83	3.75	3.37	3.10	3.58	3.28	3.06
	195	5.00	4.68	4.42	4.30	3.89	3.58	4.10	3.77	3.52
	220	5.63	5.28	5.00	4.85	4.40	4.06	4.62	4.26	3.98
Surfaced four sides										
2 x 38 x	140	2.88	2.63	2.43	2.43	2.08	1.77	2.33	2.01	1.74
	184	3.81	3.51	3.28	3.23	2.78	2.40	3.08	2.65	2.32
	235	4.87	4.53	4.26	4.14	3.58	3.11	3.94	3.39	2.99
2 x 63 x	140	3.41	3.14	2.93	2.90	2.59	2.36	2.78	2.53	2.31
	184	4.48	4.17	3.92	3.83	3.45	3.16	3.66	3.35	3.06
	235	5.70	5.35	5.05	4.90	4.44	4.09	4.66	4.30	3.90

*Surfaced top and bottom

For values of d_3 other than 1.0m, 2.0m or 3.0m, interpolation is permitted.

Requirement
to which the
Guidance
relates

A1

Table 5 PERMISSIBLE CLEAR SPANS (m) OF SC4 TRIMMING JOISTS WHICH SUPPORT A TRIMMER AND NON LOADBEARING LIGHTWEIGHT PARTITIONS. (Figure 11)

Size of trimming joist (mm)		See Plan B for positions of d_1, d_2 d_3 and S								
		For ratios of d_1/d_2 up to 0.25			For ratios of d_1/d_2 greater than 0.25 but less than 0.5			For ratios of d_1/d_2 greater than 0.5 but less than 0.75		
		Dimensions d_3 (m)			Dimensions d_3 (m)			Dimensions d_3 (m)		
		1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0
		Clear spans (m) S on Plan B								
Regularized*										
2 x 38 x	147	3.16	2.90	2.69	2.68	2.37	2.15	2.56	2.33	2.15
	170	3.67	3.38	3.15	3.11	2.77	2.52	2.97	2.71	2.50
	195	4.21	3.90	3.65	3.58	3.20	2.93	3.41	3.12	2.89
	220	4.75	4.42	4.15	4.05	3.63	3.33	3.85	3.53	3.29
2 x 47 x	147	3.39	3.12	2.91	2.86	2.56	2.33	2.76	2.51	2.32
	170	3.93	3.64	3.40	3.35	2.99	2.73	3.20	2.92	2.71
	195	4.51	4.19	3.94	3.85	3.45	3.17	3.67	3.36	3.12
	220	5.06	4.75	4.47	4.35	3.92	3.60	4.14	3.80	3.54
2 x 63 x	147	3.73	3.45	3.22	3.18	2.85	2.61	3.05	2.78	2.58
	170	4.31	4.01	3.77	3.69	3.32	3.05	3.52	3.23	3.01
	195	4.94	4.62	4.35	4.24	3.83	3.52	4.04	3.72	3.46
	220	5.56	5.21	4.93	4.78	4.33	4.00	4.56	4.20	3.92
2 x 75 x	147	3.94	3.66	3.43	3.38	3.03	2.78	3.23	2.95	2.75
	170	4.55	4.25	4.00	3.91	3.52	3.24	3.73	3.43	3.19
	195	5.21	4.88	4.61	4.48	4.06	3.74	4.28	3.94	3.68
	220	5.85	5.50	5.21	5.05	4.59	4.25	4.82	4.45	4.16
Surfaced four sides										
2 x 38 x	140	3.01	2.76	2.56	2.55	2.25	2.04	2.44	2.21	2.04
	184	3.98	3.68	3.44	3.38	3.02	2.75	3.22	2.94	2.73
	235	5.08	4.74	4.46	4.33	3.90	3.58	4.12	3.78	3.52
2 x 63 x	140	3.56	3.29	3.07	3.03	2.71	2.48	2.90	2.65	2.46
	184	4.67	4.36	4.10	4.00	3.61	3.32	3.82	3.51	3.27
	235	5.93	5.57	5.28	5.11	4.64	4.29	4.87	4.49	4.20

*Surfaced top and bottom
For values of d, greater than 1.0m, 2.0m or 3.0m, interpolation Is permitted

2.6 Strutting

2.6.1 To provide additional stiffness to floors, joists should be restrained at supports and along the span as outlined in Table 6. A1

Table 6 STRUTTING TO JOISTS

Joist span (m)	Rows of strutting
Up to 2.5	None
2.5 to 4.5	1
Over 4.5	2

Requirement
to which the
Guidance
relates

2.6.2 Timber herringbone strutting should be at least 38 x 38 mm. A1

2.6.3 Solid strutting should be at least 38 mm thick and extend at least half the joist depth. A1

2.6.4 At each end of a row of strutting the last joist should be blocked solidly at the perimeter wall as shown in Figure 12. A1

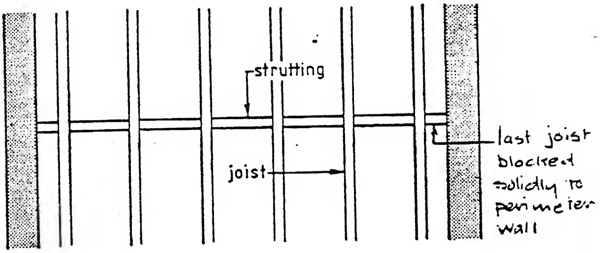


Figure 12 - Blocking to perimeter wall

2.6.5 Solid strutting with the top face flush with the top of the joists should be provided below door openings in internal partitions and the floor decking should be securely fixed to this strutting. Good practice

2.7 Floor decking - tongued and grooved softwood boarding

2.7.1 Softwood boarding should comply with BS 1297: 1987 "Specification for tongued and grooved softwood flooring". A1

2.7.2 The moisture content of the boarding should not exceed 19% at the time of laying. BS 1297

2.7.3 Where the boarding is proposed as an exposed decorative feature it should be laid after the drying out of the building. Lower moisture contents may be required eg for a dwelling with average room temperatures of 12-19° C the average moisture content should be 12 +/- 2%. Good practice

2.7.4 Boarding should not be laid until the building is weathertight unless specific protection is provided. Good practice

~~2.7.5~~ ~~An expansion gap of at least 10mm should be left at room edges parallel with the long edges of the boards.~~ ~~Good practice~~

2.7.6 In all cases floor decking should be laid and fixed in accordance with BS 8201: 1987 "Code of practice for flooring of timber, timber products and wood based panel products" ~~or strictly in accordance with manufacturer's instructions where these exceed BS 8201: 1987~~. A1

2.7.7 Table 7 shows the minimum finished board thickness for the given maximum joist spacing for an imposed load of 1.5 kN/m^2 and the alternative concentrated load of 1.4kN.

Table 7 SOFTWOOD BOARDING

Maximum joist spacing (mm)	Finished board thickness (mm)
450	16
600	19

2.8 Floor decking - plywood

		Requirement to which the Guidance relates
2.8.1	Plywood for flooring should be one of those grades listed in BS 5268: Part 2: 1988.	A1
2.8.2	Plywood for flooring should be WPB or Exterior bonded.	Good practice
2.8.3.	Other plywoods may be used but should be independently assessed as suitable for the purpose.	A1
2.8.4	For flooring, factors other than the strength should be considered as these may affect the functional performance of the floor, eg the upper face veneer should be free from open defects.	Good practice
2.8.5	An expansion gap of at least 10 mm should be left at all room edges.	Good practice
2.8.6	In all cases floor decking should be laid and fixed in accordance with BS 8201: 1987 "Code of practice for flooring of timber, timber products and wood based panel products" or strictly in accordance with manufacturer's instructions where these exceed BS 8201: 1987.	A1
2.8.7	Table 8 shows the minimum plywood thickness for the given maximum joist spacing for an imposed load of 1.5 kN/m^2 and the alternative concentrated load of 1.4kN.	A1

Table 8 PLYWOOD FLOORING

Maximum joist spacing (mm)	400	450	610
Plywood type	Required nominal thickness (mm)		
American construction and industrial plwood C-D grade: Exterior: unsanded	15.0	15.0	18.0
American construction and industrial plywood C-C grade: Exterior: unsanded	15.0	15.0	18.0
American construction and industrial plywood A-C/B-C grade: Exterior: sanded	15.0	15.0	18.0
Canadian Douglas fir plywood Select tight face, Select and Sheathing grades: unsanded	15.5	15.5	15.5
Canadian softwood plywood Select tight face, Select and Sheathing grades: unsanded	15.5	15.5	18.5
Finnish birch faced plywood I/I, I,II etc: sanded	15.0	15.0	18.0
Finnish conifer plywood I/I, I/II etc, sanded	15.0	15.0	18.0
Swedish softwood plywood P30 grade: unsanded	16.0	16.0	19.0

2.9 Floor decking - chipboard

2.9.1	Chipboard for flooring should comply with the requirements of BS 5669: Part 2: 1989 "Specification for wood chipboard".	A1
2.9.2	Type C4 from BS 5669: Part 2 should be used for all domestic flooring.	Good practice
2.9.3	Chipboard should be conditioned on site by laying the boards in place for 24 hours before fixing down.	Good practice
2.9.4	Chipboard should not be laid until the building is weathertight unless specific protection is provided.	Good practice
2.9.5	An expansion gap of at least 10mm or 1mm per metre run of floor, whichever is the greater, should be left at all room edges.	Good practice

Requirement
to which the
Guidance
relates

2.9.6 In all cases floor decking should be laid and fixed in accordance with BS 8201: 1987 "Code of practice for flooring of timber, timber products and wood based panel products" or strictly in accordance with manufacturer's instructions where these exceed BS 8201: 1987. **A1**

2.9.7 Table 9 shows the minimum chipboard thickness for the given maximum joist spacing for an imposed load of 1.5 kN/m^2 and the alternative concentrated load of 1.4kN. **A1**

Table 9 CHIPBOARD TYPE C4

Maximum joist spacing (mm)	Thickness (mm)
450	18 & 19
600	22

2.10 Floor decking - Orientated Strand Board (OSB) flooring

2.10.1 Orientated strand board for flooring should be independently assessed as suitable for the purpose. **A1**

2.10.2 OSB should be conditioned on site by laying the boards in place for 24 hours before fixing down. Good practice

2.10.3 OSB should not be laid until the building is weathertight unless specific protection is provided. Good practice

2.10.4 An expansion gap of at least 10mm or 1.5mm per metre run of floor, whichever is the greater, should be left at all room edges. Good practice

2.10.5 In all cases floor decking should be laid and fixed in accordance with BS 8201: 1987 "Code of practice for flooring of timber, timber products and wood based panel products" or strictly in accordance with manufacturer's instructions where these exceed BS 8201: 1987. **A1**

2.10.6 The minimum OSB thickness for given joist spacings for an imposed load of 1.5 kN/m^2 should be provided by the independent assessment. **A1**

2.11 Supporting non-loadbearing partitions

2.11.1 Internal partitions up to a weight of 0.8 kN/m run (81.5 kg/m run) should be supported as shown in Figure 13. **A1**

2.11.2 Due to the risks of plaster and mortar joint cracking under floor deflection, masonry partitions should not be supported off timber floors. Good practice

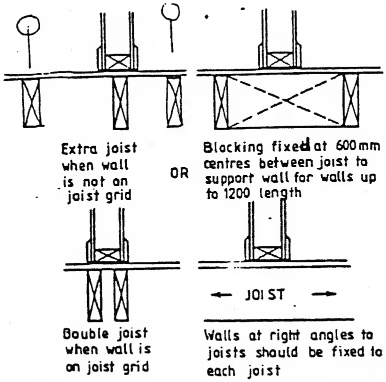

Extra joist when wall is not on joist grid
OR
Blocking fixed at 600mm centres between joist to support wall for walls up to 1200 length
Double joist when wall is on joist grid
JOIST
Walls at right angles to joists should be fixed to each joist

Figure 13 - Supporting non-loadbearing partitions

3.0 FIRE SPREAD

3.1 Internal fire spread (surfaces)

3.1.1 Limits on the surface spread of flame properties are applicable only to the underside or ceilings of the floors considered in this document. B2

3.1.2 Table 10 shows the minimum classification for ceiling surfaces in dwellings. Classes 1 and 3 are based on tests to BS 476: Part 7: 1987 "Method for classification of the surface spread of flame of products". A Class 0 material or the surface of a product is either: B2

- composed throughout of materials of limited combustibility, or
- a Class 1 material which has a fire propagation index (I) of not more than 12, and (i_1) of not more than 6.

Table10 SURFACE CLASSIFICATION FOR CEILINGS AND UNDERSIDE OF FLOORS

Small rooms (floor area not more than $4m^2$)	Other rooms	Circulation areas
Class 3	Class 1	Class 1*

* Class 0 in the common areas of blocks of flats

3.1.3 Materials suitable for ceilings and which meet the Class 0 and Class 1 classification include plasterboards (painted or not) and mineral fibre tiles or sheets with cement or resin binding. Those which meet the Class 3 requirements include timber or plywood with a density more than 400 kg/m^3 (painted or not) and wood particleboard or hardboard (painted or not). However, it is not possible to assign classifications generally to such types of building materials and test evidence to validate claims may be required by control authorities. B2

3.1.4 Other materials intended for use as ceilings should be tested to BS 476: Part 7 or be independently assessed to ensure that they meet the required minimum classification. B2

3.1.5 Timber and timber-based materials may be upgraded from Class 3 to Class 1 or Class O by applying proprietary impregnation and/or surface treatments. All such treatments should be tested or independently assessed as suitable for the purpose. B2

3.2 Internal fire spread (structure)

3.2.1 Fire resistance

3.2.1.1 A floor in the upper storey of a two storey dwelling which is not over a garage or carport can have a modified 30 minute fire resistance, ie 30 minutes stability, 15 minutes integrity and 15 minutes insulation when tested to BS 476: Part 21: 1987 "Methods for determination of the fire resistance of loadbearing elements of construction". B3(1)

3.2.1.2 All other floors require either 30 minute or 60 minute fire resistance ie either 30 minutes or 60 minutes respectively for stability, integrity and insulation when tested to BS 476: Part 21 exposed from the underside. Table 11 shows the minimum periods of fire resistance for floors other than compartment floors, including floors over basements, garages and carports and intermediate floors. B3(1)

Table 11 MINIMUM PERIOD OF FIRE RESISTANCE FOR FLOORS

Building Type	Minimum fire resistance period (minutes)		
	Basement storey including floor over	Ground or Upper storey	
	Depth of lowest basement	Height to finished floor level of top storey above ground in building or separated part of building	
	Not more than 10m	Not more than 5m	Not more than 20m
Flats and maisonettes	60	30	60 **
Dwelling houses	30	30 *	60

* See Clause 3.2.1.1
** Reduced to 30 minutes for any floor within a maisonette, but not if the floor contributes to the support of the building.

3.2.1.3 Table 12 shows the most common floor constructions which comply with the requirements of Table 11. B3(1)

Table 12 FLOOR CONSTRUCTION FOR FIRE RESISTANCE

Modified 30 minute fire resistance Stability 30 minutes: Integrity 15 minutes: Insulation 15 minutes

Joists minimum breadth (mm)	Floor deck	Ceiling type
37	Any structurally suitable flooring, see Tables 7-9 and section 2.10.6	a) 12.5 mm plasterboard with joints filled and backed with timber or b) 9.5 mm plasterboard with 10 mm lightweight gypsum plaster finish
37	At least 15 mm t & g boarding or sheets of plywood or chipboard	a) 12.5 mm plasterboard with joints taped and filled or b) 9.5 mm plasterboard with at least 5 mm gypsum plaster finish

30 minute fire resistance

Joists minimum breadth (mm)	Floor deck	Ceiling type
37	At least 15 mm t & g boarding or sheets of t & g plywood or chipboard	12.5 mm plasterboard with at least 5 mm neat gypsum plaster finish
37	At least 21 mm t & g boarding or sheets of plywood or chipboard	12.5 mm plasterboard with joints taped and filled
37	At least 15 mm t & g boarding or sheets of plywood or chipboard	Two layers of 12.5 mm plasterboard with joints staggered. Joints in outer layers taped and filled

60 minute fire resistance

Joists minimum breadth (mm)	Floor deck	Ceiling type
47	At least 15 mm t & g plywood or wood chipboard	Not less than 30 mm plasterboard (normally 19 mm plus 12.5 mm) with joints staggered. Joints in outer layer taped and filled

Note:
Other ceiling board materials with similar performance may be substituted for plasterboard. Information on tested materials and elements is given in manufacturers and trade association literature.

3.2.1.4 The quality of plasterboard specified and the method of fixing are important contributers to the overall fire resistance of the floor constructions shown in Table 12. Plasterboard should comply with the requirements of BS 1230: Part 1: 1985 "Specification for plasterboard excluding materials submitted to secondary operations". Plasterboard fixings should be in accordance with BS 8212: 1988 "Code of practice for dry lining and partitioning using gypsum plasterboard" or in accordance with manufacturers instructions where these exceed the requirements of BS 8212: 1988. B3(1)

3.2.1.5 Floor constructions not shown in Table 12 may be used but compliance with the guidance given in Table 11should be shown in one of the following ways: B3(1)

- A fire test report from a NAMAS approved fire test laboratory for the floor tested to BS 476: Part 21: 1987.
- A floor construction calculated as suitable using the method shown in BS 5268: Part 4: Section 4.2: 1990 "Recommendations for calculating fire resistance of timber stud wall and joisted floors".
- A fire resistance assessment for the floor from a NAMAS approved body.

3.2.1.6 Where downstand beams project below the ceiling, these should have the same fire resistance as the floor construction. Where the downstand beam contributes to the structure as a whole, independent of the floor joists, a higher period of fire resistance may be required. Fire resistance can be incorporated into the beam design as sacrificial timber or be obtained by lining with plasterboard or additional sacrificial timber cladding of the required thickness eg 18 mm of softwood board (minimum density 400 kg/m^3) cladding will protect the beam for 30 minutes (ie 0.6 mm of softwood per minute required). A similar solution is required if it is proposed to expose the floor joists to the room below (Figure 14). B3(1)

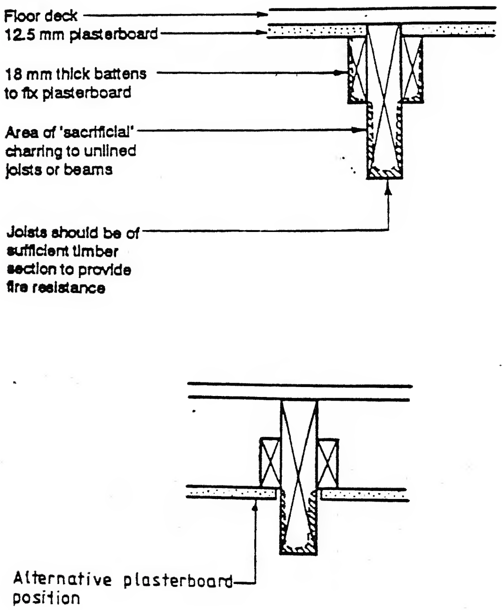
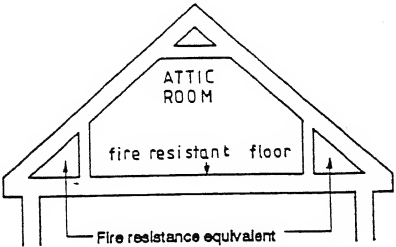

Floor deck
12.5 mm plasterboard
18 mm thick battens to fix plasterboard
Area of 'sacrificial' charring to unlined joists or beams
Joists should be of sufficient timber section to provide fire resistance
Alternative plasterboard position

Figure 14 - Downstand beams and exposed floor joists

3.2.1.7 The method for calculating sacrificial timber is given in BS 5268: Part 4: Section 4.1: 1978 "Method of calculating fire resistance of timber members". B3(1)

3.2.1.8 Any floor cantilevered over an external wall below should, if it supports an element of structure, have the same fire resistance as the floor within the building. B3(1)

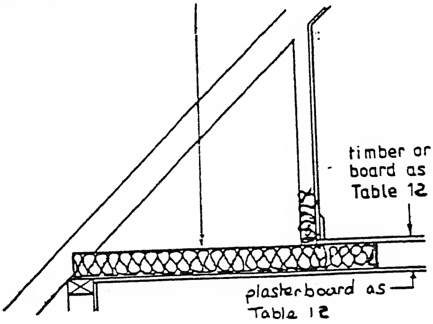
3.2.1.9 In certain attic rooms the floor becomes part of the roof at the edges (Figure 15). In such cases this area should have fire resistance which is equivalent to the adjacent floor. Figure 16 shows an example of this construction for 30 minute fire resistance. B3(1)



Fire resistance equivalent to floor should be provided here

Figure 15 - Fire resistance with attic rooms

Minimum 100 mm mineral wool minimum density 48 kg/m^3 tightly packed between joists on wire mesh support stapled at least 50 mm up the sides of joists to give fire resistance equivalent to floor and to cover punched metal plate fasteners at the floor level. Additional insulation may be required for thermal resistance eg add a layer of lower density mineral wool.



Note:
If a warm roof is used or if the thermal insulation follows the rafter pitch this detail is still required to provide fire resistance

Figure 16 - Edge detail for attic rooms

Requirement
to which the
Guidance
relates

3.2.1.10 Where prefabricated roof panels are used for attic room construction, the floor decking can run continuously through to the eaves and the fire resistance is achieved by the methods shown in Table 12. This may also be achieved in cut roofs where purlins run gable to gable ie struts do not interrupt the continuity of the floor deck. This detail is not practical with attic trusses where the detail shown in Figure 16 will be required. B3(1)

3.2.2 Cavity barriers in floors

3.2.2.1 Hidden voids in the construction of a building can provide a ready route for smoke and flame spread. As the spread is concealed it can present a greater danger than would an obvious fire weakness in the building structure. Thus, for 30 minute and 60 minute fire resisting floors, provision should be made to restrict the hidden spread of fire in the concealed spaces by closing the edge of cavities and by subdividing extensive cavities. B3(4)

3.2.2.2 In a platform floor (Figure 4) the edge of the cavity is effectively sealed by the edge joists on the parallel sides and the header joists on the right angle sides. Where joists are built-in or joist hangers are used (Figure 2 and 3) the abutting walls act as an effective cavity closer. B3(4)

3.2.2.3 The cavities in timber joisted floors should be sub-divided so as not to exceed 10 metres. This is most easily achieved by installing full joist depth solid timber blocking of at least 38 mm thickness. Other practical options are 12.5 mm plasterboard or a wire reinforced mineral wool blanket. B3(4)

4.0 CONSERVATION OF FUEL AND POWER

4.1 Certain floors between the dwelling and an unheated space which are 30 minute and 60 minute fire resistant may also require measures to limit heat loss through the floor. These floor types, the U value requirements and the minimum thickness of mineral wool insulation (λ=0.04 W/mK) to meet the U values are shown in Table 13. The floor types shown in Table 13 need not always comply with the U values shown, as various trade-offs with other elements may be calculated to show overall building compliance with Part L1 of the Building Regulations. These methods are described fully in Approved Document L: ~~1989~~. 1990 EDITION. L1

Table 13 MAXIMUM FLOOR U VALUES FOR DWELLINGS

Floor type	U value (W/m^{2}K)	Mineral wool (glass or rock) mm
Exposed floor eg cantilever floor or over carport	0.45	80
Semi-exposed floor eg over garage or unheated basement	0.6	60
Floor as part of roof eg as Figure 15	0.25	150

4.2 Other rigid insulation materials may be used in place of mineral wool but care is required in cutting these accurately between joists to avoid cold bridging. Where rigid insulation is used, solid rather than herringbone strutting should be used. Good practice

4.3 Where attic rooms occur and rigid insulation is used the edge detail should be checked for fire resistance (see 3.1.2.9 and 3.1.2.10). B3(1)

4.4 Guidance on the calculation of thickness of alternative insulation materials is given in Approved Document L and the CIBSE Guide A3: 1981 "Thermal properties of building structures".

Regulation L1

4.5 **Exposed floors**

Exposed floors eg cantilever floor or over a carport which have a soffit lining of high vapour resistance may require a vapour control layer to the warm side of the insulation to minimize the risk of interstitial condensation. The vapour resistance on the warm side of the insulation should be at least five times greater than the vapour resistance on the cold side. Table 14 gives the vapour resistance and resistivities of some common floor construction materials.

Good practice

Table 14 VAPOUR RESISTIVITY AND RESISTANCE FOR MATERIALS

Vapour resistance is found by multiplying resistivity by thickness in metres

Material	Vapour resistivity (MNs/gm)	Vapour resistance (MNs/g)
Timber boarding	60	-
Plywood decking	2000	-
Chipboard	500	-
OSB	1950	-
Mineral wool (glass or rock)	7	-
Plasterboard	60	-
Gypsum plaster	60	-
Mineral fibre boards	300	-
Emulsion paint	-	0.5
Gloss paint	-	15
0.12 mm polythene	-	250
0.25 mm polythene	-	500
Aluminium foil	-	1000

5.0 SOUND INSULATION TO WC COMPARTMENTS

5.1 Floors which separate a room containing a wc from another part of a dwelling should be insulated to provide a level of sound reduction equivalent to that obtained when the deck is 18 mm timber or timberbased board, the ceiling lining is 12.5 mm plasterboard (or 9 mm plasterboard with skim) and minimum 60 mm mineral wool insulation is fitted tightly between the joists.

Good practice

6.0 INSTALLING SERVICES

6.1 Notching and drilling of joists for services should not exceed the limits set out in Clause 2.4.1 and Figure 9.

BS 5268 Part 2

6.2 Points of potential leakage in water-carrying pipes eg drain cocks or joints should be accessible. Screwed access panels should be provided in floors with sheet material decks. No special provision is required in softwood board decks as tongues can be removed from individual boards where access is required.

Water by-laws

6.3 Pipes and ducts in most intermediate floors do not require insulation since heat lost is useful to the room above.

L1

Pipes and ducts in insulated floors (see Table 13) may require insulation unless the heat lost is useful to the room above. Adequate insulation will be provided if a pipe or duct is surrounded by the floor insulation. Pipes or ducts below the insulation should be enclosed in material with a thermal conductivity not greater than 0.045 W/mK, of thickness equal to the diameter of the pipe up to a maximum of 40mm. Alternatively for pipes, and in the case of ducts, the insulation should meet the requirements of BS 5422: 1990 "Method for specifying thermal insulating materials on pipes, ductwork and equipment".

6.4 In insulated floors (see Table 13 and Clause 5.1), electrical cables within or close to insulation should be de-rated to reduce the risk of overheating; by 50% if the cable is surrounded, by 25% when the insulation is on one side only, and by 10% when the cable is in a void surrounded by insulation. IEE requirements

6.5 To avoid the risk of embrittlement, pvc sheathed electric cables should not be in direct contact with expanded polystyrene insulation. Good practice

6.6 Soil and vent pipes should be set out between joists to avoid cutting and trimming. Good practice

6.7 Chimneys and flue pipes for Class 1 and Class 2 appliances must be separated from combustible material by the distances shown in Figure 17. J3

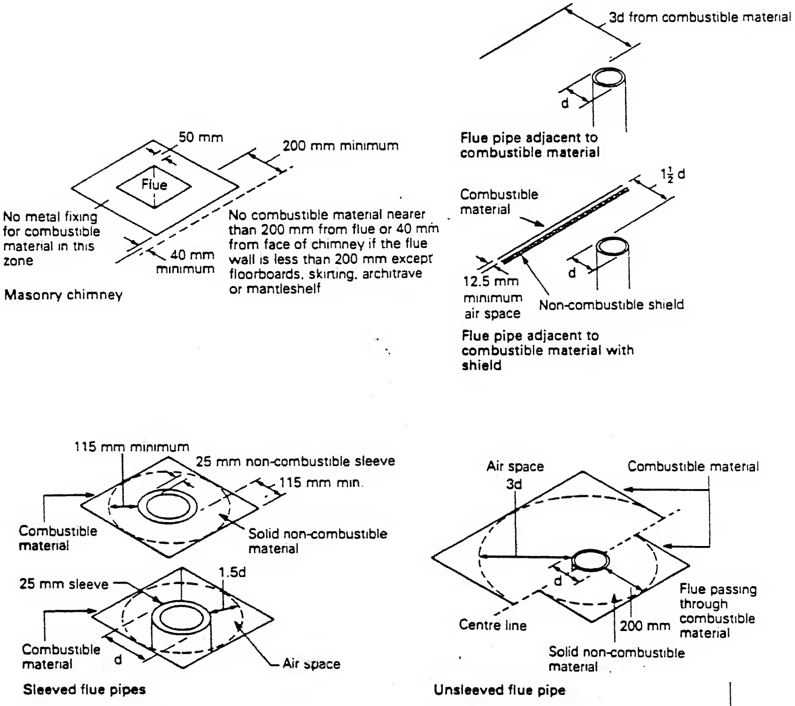

3d from combustible material
d
Flue pipe adjacent to combustible material
50 mm
200 mm minimum
Flue
No metal fixing for combustible material in this zone
40 mm minimum
No combustible material nearer than 200 mm from flue or 40 mm from face of chimney if the flue wall is less than 200 mm except floorboards, skirting, architrave or mantleshelf
Masonry chimney
Combustible material
1½ d
d
12.5 mm minimum air space
Non-combustible shield
Flue pipe adjacent to combustible material with shield
115 mm minimum
25 mm non-combustible sleeve
115 mm min.
Combustible material
Solid non-combustible material
25 mm sleeve
1.5d
Combustible material
d
Air space
Sleeved flue pipes
Air space
3d
Combustible material
d
Flue passing through combustible material
Centre line
200 mm
Solid non-combustible material
Unsleeved flue pipe

Figure 17(a) Separation of combustible material from flues - Solid fuel and oil burning appliances (Class 1).

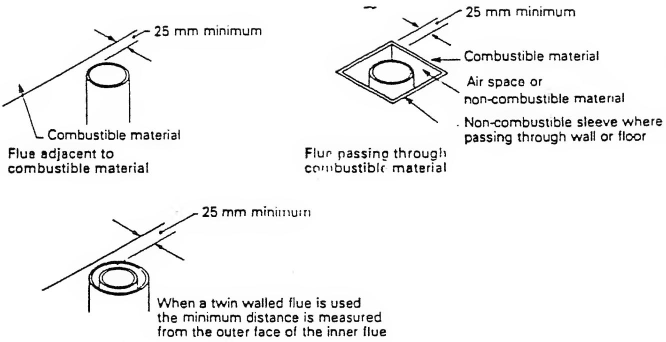

25 mm minimum
Combustible material
Flue adjacent to combustible material
25 mm minimum
Combustible material
Air space or non-combustible material
Non-combustible sleeve where passing through wall or floor
Flue passing through combustible material
25 mm minimum
When a twin walled flue is used the minimum distance is measured from the outer face of the inner flue

Figure 17(b) Separation of combustible material from flues - Gas appliances (CLass 2).

6.7 Timber should not be placed under a constructional hearth unless it supports the edge of the hearth or there is an airspace of at least 50mm between the timber and the underside of the hearth or a distance of at least 250 mm between the timber and the top of the hearth. See Figure 18.

Regulation J3

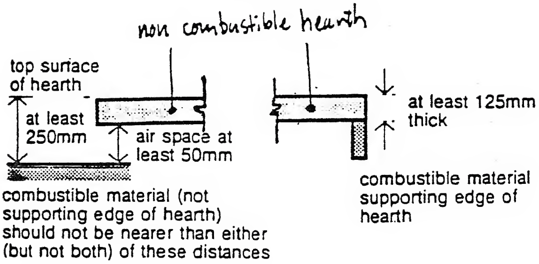

non combustible hearth
top surface of hearth
at least 250mm
air space at least 50mm
combustible material (not supporting edge of hearth) should not be nearer than either (but not both) of these distances
at least 125mm thick
combustible material supporting edge of hearth

Figure 18

Further information and alternative methods of compliance with Regulations A1, B2, B3, J3 and L1 may be found in the following approved documents:

- Approved Document A - Structure, HMSO 1991
- Approved Document B - Fire Safety, HMSO 1991
- Approved Document J - Heat Producing Appliances, HMSO ~~1989~~ 1990
- Approved Document L - Conservation of fuel and power, HMSO ~~1989~~. 1990

BRITISH STANDARDS REFERRED TO IN THIS DOCUMENT

BS 476	**Fire tests on building materials and structures**
Part 7	Method for classification of the surface spread of flame of products. 1987.
Part 21	Methods for determination of the fire resistance of loadbearing elements of construction. 1987.
BS 1230	**Gypsum plasterboard**
Part 1	Specification for plasterboard excluding materials submitted to secondary operations. 1985.
BS 1297	**Specification for tongued and grooved softwood flooring. 1987.**
BS 4471	**Specification for sizes of sawn and processed softwood. 1987.**
BS 5250	**Code of practice for control of condensation in buildings. 1989.**
BS 5422	**Method for specifying thermal insulating materials on pipes, ductwork and equipment. 1990.**
BS 5268	**Structural use of timber**
Part 2	Code of practice for permissible stress design, materials and workmanship. 1988.
Part 4	Fire resistance of timber structures.
Section 4.1	Method of calculating fire resistance of timber members. 1978.
Section 4.2	Recommendations for calculating fire resistance of timber stud wall and joisted floors. 1990.
Part 7	Recommendations for the calculation basis for span tables.
Section 7.1	Domestic floor joists. 1989.
BS 5628	**Code of practice for use of masonry**
Part 1	Structural use of unreinforced masonry. 1973 (1985)
BS 5669	**Particleboard**
Part 2	Specification for wood chipboard. 1989
BS 6178	**Joist hangers**
Part 1	Specification for joist hangers for building into masonry walls of domestic dwellings. 1982.
BS 6399	**Loading for buildings**
Part 1	Code of practice for dead and imposed loads. 1984.
BS 8201	**Code of practice for flooring of timber, timber products and wood based panel products. 1987.**
BS 8212	**Code of practice for dry lining and partitioning using gypsum plasterboard. 1988.**